

Land Product Validation (LPV) Sub-group Meeting



Fernando Camacho – (EOLab/U. Valencia) – Chair

Vice Chair – Michael Cosh (USDA)

Subgroup meeting

3 Nov 2020

NEXT LPV TELECON 05 Jan 2021

Attendance

Participants

Fernando Camacho

Michael Cosh

Jaime Nickeson

Zhuosen Wang

Laura Duncanson

Gareth Roberts

John Bolten

Sylvain Leblanc

Carsten Montzka

Tomoaki Miura

Hongliang Fang

Louis Giglio

Pontus Olofsson

Joshua Gray

Marie Weiss

Not attending

Frank Götsche

Victor Rodríguez-Galiano

Else Swinnen

Sophie Bontemps

John Armston

Glynn Hulley

Mat Disney

Chris Crawford

Dominique Carrer

Thomas Nagler

Proposed agenda items

- Welcome
- WGCV-48 Report
- WGCV and LPV next meetings
- ESA – Land Product Validation Strategy Workshop
- Focus Area review and update status
- Focus Area Reporting

WGCV-48 virtual report

- Very short virtual meeting on 28th October). First meeting chaired by Akihiko Kuze (JAXA), with Philippe Goryl (ESA) as vice chair.
- Akihiko acknowledges Cindy Ong (CSIRO) for her leadership over the two last years
- **Chair** special interest topics:
 - Carbon and biomass to contribute to the Paris Agreement (validation of retrieved products and fluxes),
 - CEOS Analysis Ready Data (in particular for atmospheric and ocean missions, as well as industry's role),
 - Cal/Val Portal.
- **LPV** reported on the status of Soil Moisture and Biomass validation protocols and presented the proposed CEOS Forest Biomass Reference Network.
 - FRM for Soil Moisture project will kick-off in January
- **Infrared and Visible Optical Sensors (IVOS)**
 - The next round of sea surface temperature comparisons will kick-off soon. ESA has agreed to fund the next comparison. The target is Q2 2022
 - The commercial sector is keen to have an 'analysis-ready' standard to facilitate transparency with customers, and there is interest in using CARD4L as a basis. An IVOS sub-team is working on a strawman of an evolved CARD4L that fits the demands of IVOS's industry contacts.

WGCV-48 virtual report

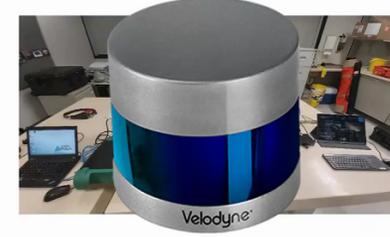
- **Terrain Mapping (TMSG)**
 - The DEMIX (Digital Elevation Models Intercomparison exercise) is the main focus of the TMSG. The first kick-off teleconference was held in June, about 30 active participants.
 - DEMIX delayed 3 months for the unusual year.
- **Copernicus DEM 30m resolution** dataset is publicly available with a **free & open licence**. Further details available at: https://spacedata.copernicus.eu/fr/explore-more/news-archive/-/asset_publisher/Ye8egYeRPLEs/blog/id/434960
- **Microwave sensors (MSSG)**
 - Soil moisture and snow water equivalent by active and passive microwave products are being discussed related to a new mission for terrestrial water cycle monitoring, CFWSAT (China-France Water Satellite), where soil moisture and snow water are two of the main targets. Combined active and passive instruments will be flown for this mission.

WGCV-48 virtual report

Geoscience Australia report

- Committed to SRIX4Veg task

Validation of Surface Reflectance - Phase 2



Aim is to cover additional sites that are not easy to access (e.g. vegetated, relief, aquatic); Phase 2 of the SR validation has commenced, with planning and acquisition of equipment and calibration of instruments

DJI Matrice 600 drone, smaller multi-rotors, Flame mini Spectrometer, Spectral Evolution SR-3500 compact full range spectrometer are being used to collect data using similar protocols from Phase 1.

Validation with Flame Spectrometer mounted on Drone

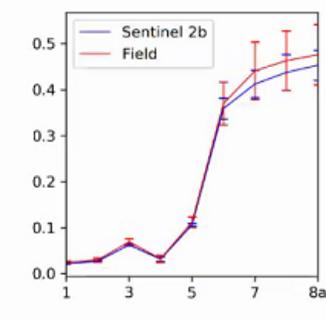
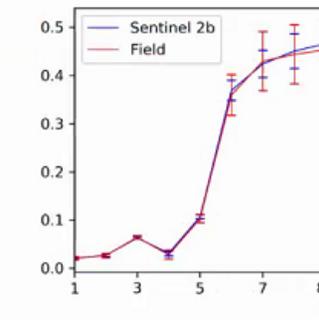
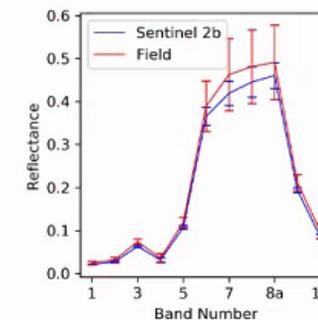
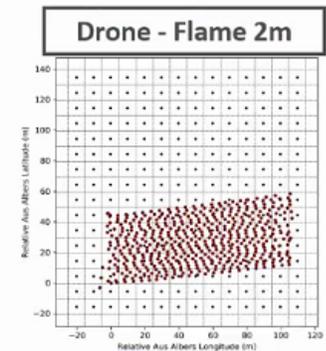
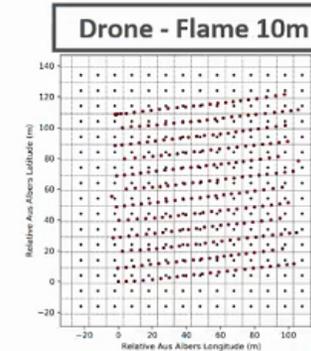
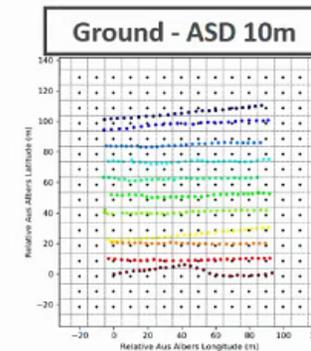
Local drone based spectrometer trials were done

Example shown for synchronous data takes with Sentinel 2B

ASD + Flame spectrometers used in tandem

Results for data takes at 10m and 2m spacing

Drone based BRDF characterisation is also being planned



WGCV and LPV next meetings

- WGCV meetings



- LPV next plenary – May 2021 Virtual

- 2 days * 2-3 hrs.

- First day invited speakers (agency and networks reports).
- Second day, FA reports / update LPV action plan.

ESA – Land Product Validation Strategy Workshop

- Virtual , 30 November and 1 December 2020. Invited EU experts.
 - 1) Land validation in a metrological context
 - 2) Future operational validation needs
 - 3) Land validation in an operational context
 - **“CEOS LPV Supersites and Pathways towards an Operational Validation System for Land ECVs” (F. Camacho, 30 min)**
 - 4) Recent advances in land validation
 - 5) Final discussion and recommendations
 - Discussion around key topics:
 - Critical spatio/temporal/thematic data gaps in current Land Cal/Val systems
 - Readiness of current networks in terms of protocols, traceability, uncertainty
 - State of play and prospect for a sustained global Land Cal/Val system
 - Synergies among current and future Land Cal/Val activities at European level
 - Recommendations and needs for the ESA Land Cal/Val strategy

Please, send to me your inputs and comments by 20th November !

Focus Area Review/Update Status

Status of updates by focus area.

Some only need a review, changes are not required, just assure all is current!

Action needed!!

Focus Area	Letter sent to leads	Home Page Review / Update	Products Reviewed/ Updated	Collaboration Review/ Update	References Updated	Listserv review/ update	Letters to community
Landcover	Apr 2019	Sept 2020	Sept 2020	Sept 2020	Sept 2020	Oct 2019	
Biophysical LAI/Fapar	Apr 2019	July 2019	July 2019	July 2019	July 2019	Oct 2019	Sep 2019
Surface Rad/Albedo	Apr 2019	Dec 2019	Oct 2019	Dec 2019	Dec 2019	Dec 2019	
LST/Emissivity	Apr 2019	Apr 2019	Apr 2019	Apr 2019	Apr 2019	Apr 2019	
Fire/Burn	Apr 2019		Mar 2020		Mar 2020		
Soil Moisture	Apr 2019		Feb 2019		Sep 2019	Sep 2019	
Phenology	Apr 2019		May 2020	Apr 2020			
Snow Cover	Apr 2019					Oct 2019	
Vegetation Index	Apr 2019	Sept 2019	May 2019	Sept 2019	May 2019	May 2019	
Biomass	Apr 2019	Apr 2019	Mar 2020	Apr 2019	Apr 2019	Oct 2019	

Focus Area Reports

- Soil Moisture
- Vegetation Indices
- Snow
- Biomass
- Land Cover
- Biophysical (LAI/FAPAR)
- Fire/Burn Area
- LST&E
- Surface radiation
- Phenology

Soil Moisture (1/2)

News:

- **Good Practices Protocol: After feedback from the community the final version has been published:**
Montzka, C., M. Cosh, B. Bayat, A. Al Bitar, A. Berg, R. Bindlish, H. R. Bogena, J. D. Bolten, F. Cabot, T. Caldwell, S. Chan, A. Colliander, W. Crow, N. Das, G. De Lannoy, W. Dorigo, S. R. Evett, A. Gruber, S. Hahn, T. Jagdhuber, S. Jones, Y. Kerr, S. Kim, C. Koyama, M. Kurum, E. Lopez-Baeza, F. Mattia, K. McColl, S. Mecklenburg, B. Mohanty, P. O'Neill, D. Or, T. Pellarin, G. P. Petropoulos, M. Piles, R. H. Reichle, N. Rodriguez-Fernandez, C. Rüdiger, T. Scanlon, R. C. Schwartz, D. Spengler, P. Srivastava, S. Suman, R. van der Schalie, W. Wagner, U. Wegmüller, J.-P. Wigneron, F. Camacho, and J. Nickeson (2020): Soil Moisture Product Validation Good Practices Protocol Version 1.0. In: C. Montzka, M. Cosh, J. Nickeson, F. Camacho (Eds.): Good Practices for Satellite Derived Land Product Validation (p. 123), Land Product Validation Subgroup (WGCV/CEOS), doi:10.5067/doc/ceoswgcv/lpv/sm.001.
- Bayat, B., F. Camacho, J. Nickeson, M. Cosh, J. Bolten, H. Vereecken, and C. Montzka (2021): **Toward Operational Validation Systems for Global Satellite-Based Terrestrial Essential Climate Variables.** International Journal of Applied Earth Observations and Geoinformation 95, 102240. DOI:10.1016/j.jag.2020.102240.

Soil Moisture (2/2)

News (con't)

- A new proposal for the bistatic L-band fully polarimetric SAR mission Tandem-L is prepared for the German Helmholtz roadmap. Could become interesting also for other focus areas (e.g., snow, biomass).
- Plans for a German Monitoring network TerraNet: Multi-compartment real-time monitoring (in situ and remote) of hydrologic and bio-physical variables including their implementation in high performance computing simulations and forecasting.

Workshops:

- National Coordinated Soil Moisture Monitoring Network (NCSMMN) Town Hall at AGU is scheduled for December 14th 2020 at 1-2 pm ET / 10-11 am PT
- 6th Satellite Soil Moisture Validation and Application Workshop, postponed to autumn 2021, Perugia, Italy
- SMOS for Climate symposium, postponed to 9-11th March 2021 at the Eden project, UK
- 7th Satellite Soil Moisture Validation and Application Workshop, Fall 2022, New Orleans, USA

Vegetation Indices

Began drafting an outline of the VI validation good practices document, referring to:

- The good practices documents of LAI and albedo
- The outcomes from the last VI focus area workshop (December 2018)

New publication on product inter-comparison:

- Tran, N. N., Huete, A., Nguyen, H., Grant, I., Miura, T., Ma, X., . . . Ebert, E. (2020). Seasonal comparisons of Himawari-8 AHI and MODIS vegetation indices over latitudinal Australian grassland sites. *Remote Sensing*, 12(15), 2494. doi:10.3390/rs12152494

Snow (1/2)

- Update on Snow Products:
- ESA SNOW-CCI:
 - New Snow Cover products V1: planned to be released by mid Nov., 2020
 - daily, global, ~1 km, Dec 2000- Dec 2019, from MODIS
 - daily, global, ~5 km, 1980- Dec 2019, from AVHRR
- EEA Copernicus High Resolution Snow Extent Services:
 - from Sentinel-2 (20m, near real time; Europe; planned for May 2020); released by Mid July 2020; User Consultation WS (via WEBEX), 15-16 October 2020
 - Wet snow extent from S1 for HR FSC snow layer: development and implementation of service started (prototype planned by Q3/Q4 2021).

Snow 2/2

- Second Satellite Snow Product Validation and Intercomparison Exercise (SNOWPEX): Kickoff of by September 2020;
 - Extension of period with 2015-2020
 - New Satellite & Sensors
 - Improved Snow Algorithms and Products
 - Consolidation of trends of snow extent
 - ISSPI-3 planned for Q3 2021 (TBD; COVID status) (SnowPEX Partners informed by mid of Nov 2020).
- **Upcoming relevant Workshops:**
 - EC ESA EO for Water, 16 – 19 November 2020, <http://eo4water2020.esa.int/>

Above Ground Biomass

- Two presentations at October CEOS plenary: 1) Protocol update and 2) Proposed biomass reference network
 - Protocol draft complete and in public review (!!). Open for comments until December 15th
 - Scheduled for endorsement at SIT-35 (was to be endorsed at October 2020 plenary, but pushed for longer review period)
 - Proposed reference network presented to CEOS principals, but also now to GFOI and the World Bank (searching for large investment, if successful would be useful for other focus areas).
- A Biomass Change Workshop, hosted by the Biomass CCI (<https://climate.esa.int/en/events/biomass-change-workshop-19-october-6-november-2020/>)
The focus of the third week is on change, with a planned outcome to work toward a biomass change chapter for the protocol (V2)
- Multi-mission group still very active – constantly growing; quick mission updates
- JAXA, ISRO, CNES, NASA, ESA all contributing in some way to the reference network. Hoping to start small, and build. ESA requested a prioritization of sites. We are also working to breakdown the budget into separate data collection and curation activities (~50/50).
- BRIX2 activity launch in Feb, 2021
- ICESat-2 and GEDI products continue to flow, with early GEDI biomass products coming out early 2021.

Land Cover

- Sophie Bontemps has organized a special session that has been accepted for IGARSS 2021
CEOS Land Product Validation: Sampling-based estimation of area and accuracy for Land Cover products
- The World Bank is sponsoring the development of tutorials that aim to take user reporting under REDD+ from pre-processing of data, to running algorithms in GoogleEarth Engine, to sampling-based approach to estimate of area and map accuracy. LC focus area involved in this effort, which is proposed to be called OpenMRV. This is an attempt to help users navigate the various tools and platforms and to help consolidate what is out there.

Fire Disturbance

Updated the website

Publications

- Active fire validation
- Burned area validation
- Product development

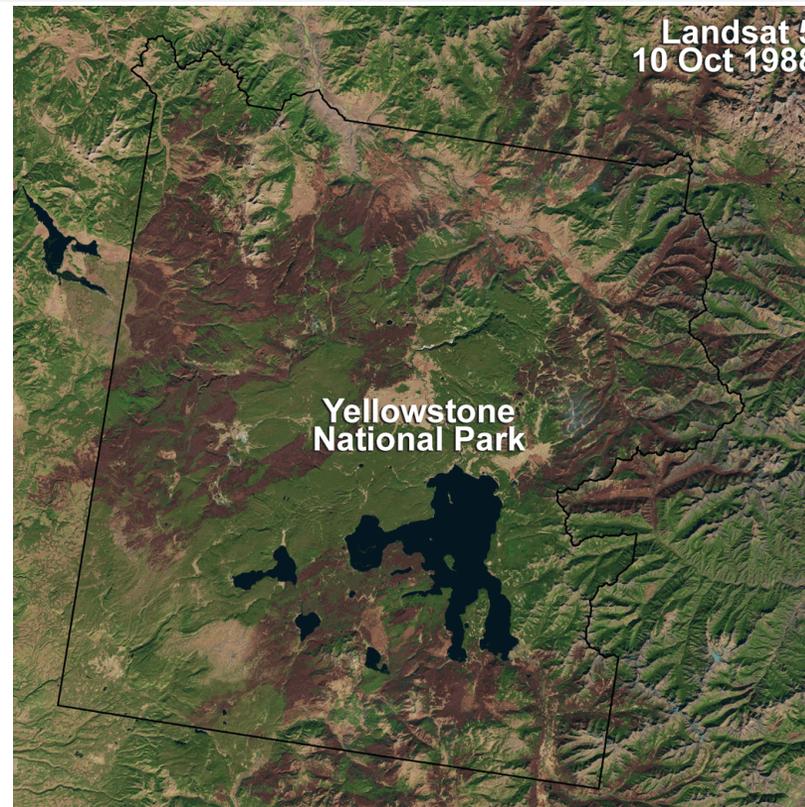
Available products

- Remove obsolete products

Landsat Level-3 burned area product over CONUS

- Analysis ready
- 1984 – present

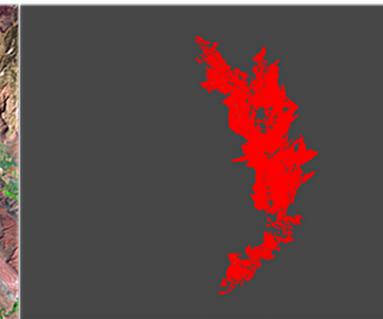
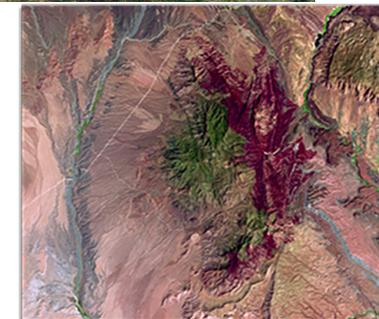
Burn Probability and burn classification



USGS

Hawbaker, T.J., Vanderhoof, M.K., Schmidt, G.L., Beal, Y.-J., Picotte, J.J., Takacs, J.D., Falgout, J.T., Dwyer, J.L., 2020. The Landsat Burned Area algorithm and products for the United States. Remote Sensing of the Environment 244. <https://doi.org/10.1016/j.rse.2020.111801>

Hawbaker, T.J., Vanderhoof, M.K., Beal, Y.-J., Takacs, J.D., Schmidt, G.L., Falgout, J.T., Williams, B., Brunner, N.M., Caldwell, M.K., Picotte, J.J., Howard, S.M., Stitt, S., Dwyer, J.L., 2017a. Landsat Burned Area Essential Climate Variable products for the conterminous United States (1984 -2015). U.S. Geological Survey Data Release. <https://doi.org/10.5066/F73B5X76>



Biophysical (1/2)

- Website update
 - Reviewed website on Sep 21, 2020. Reported missing/wrong links to Jaime.
- GCOM-C LAI/FAPAR products (V2.0, 250 m, Jun 2020)

https://suzaku.eorc.jaxa.jp/GCOM_C/data/product_std.html
- Meetings
 - IGARSS'21, Jul 11-16, 2021 (Paper submission deadline Jan 8, 2021).
 - ISPRS, Nice, France, Jul 4-10, 2021.
 - RAQRS 6th, Univ. of Valencia, Spain. Sep 20-24, 2021.
 - EO for agriculture under pressure conclusions (5-9th October):
 - Need of establishing best practices and standards for data sharing
 - Lack of in situ data for agriculture, more validation needed
 - LAI/fAPAR recognized a essential agricultural variables (GEOGLAM)
- Special issues
 - LAI special issue in *Remote Sensing Technology and Application* (in Chinese), in press
Editors: H. Fang, Z. Zhu, Y. Liu and Y. Zhou
 - “Remote Sensing of Biophysical Parameters” (deadline: Nov 27, 2020)
Editors: J. GarcíaHaro (U. Valencia), H. Fang (CAS), and M. Campos-Taberner (U. Valencia)
http://www.mdpi.com/journal/remotesensing/special_issues/Biophysical_Parameters
 - "Recent Advances in Satellite Derived Global Land Product Validation" (Dec 31, 2020)
Editors: F. Camacho (U. Valencia) and J. Dash (U. Southampton)
https://www.mdpi.com/journal/remotesensing/special_issues/global_land_product_val

Biophysical (2/2)

Recently published papers

- Brown, L.A., Meier, C., Morris, H., Pastor-Guzman, J., Bai, G., Lerebourg, C., Gobron, N., Lanconelli, C., Clerici, M., & Dash, J. (2020). Evaluation of global leaf area index and fraction of absorbed photosynthetically active radiation products over North America using Copernicus Ground Based Observations for Validation data. *Remote Sensing of Environment*, 247. 10.1016/j.rse.2020.111935
- Zhao, Y., Chen, X., Smallman, T.L., Flack-Prain, S., Milodowski, D.T., & Williams, M. (2020). Characterizing the Error and Bias of Remotely Sensed LAI Products: An Example for Tropical and Subtropical Evergreen Forests in South China. *Remote Sensing*, 12. 10.3390/rs12193122
- Xu, B., Li, J., Park, T., Liu, Q., Zeng, Y., Yin, G., Yan, K., Chen, C., Zhao, J., Fan, W., Knyazikhin, Y., & Myneni, R.B. (2020). Improving leaf area index retrieval over heterogeneous surface mixed with water. *Remote Sensing of Environment*, 240, 111700. 10.1016/j.rse.2020.111700
- Akitsu, T.K., Nakaji, T., Kobayashi, H., Okano, T., Honda, Y., Bayarsaikhan, U., Terigele, Hayashi, M., Hiura, T., Ide, R., Igarashi, S., Kajiwara, K., Kumikawa, S., Matsuoka, Y., Nakano, T., Nakano, T., Okuda, A., Sato, T., Tachiiri, K., Takahashi, Y., Uchida, J., & Nasahara, K.N. (2020). Large-scale ecological field data for satellite validation in deciduous forests and grasslands. *Ecological Research* (in press)
data available at <http://db.cger.nies.go.jp/JaLTER/metacat/metacat/ERDP-2020-16.1/jalter-en>

LST&E (1/4)

COVID-19 and conferences

- AGU Fall meeting, **7-11 Dec 2020: Virtual**
 - **Temperature Session: Taking the Temperature of the Earth**
- 6th Sentinel-3 Val Team meeting: **moved to 14-17 Dec 2020**
Virtual meeting, info at: www.eventsforce.net/s3vt
- ECOSTRESS science and applications team meeting, **Dec 1, 2020, virtual**
<https://ecostress.jpl.nasa.gov/events/ecostress-science-and-applications-team-meeting-1>
- EUMETSAT Conference 2020: **cancelled**
(next: Bucharest, 20-24 Sep 2021)
- 6th Recent Advances on Quantitative Remote Sensing (RAQRS) Conference: **postponed** (Sep 2021)

LST&E (2/4)

Lake
Constance
inter-
comparison



National Oceanography
Centre, Southampton
UNIVERSITY OF SOUTHAMPTON AND
NATURAL ENVIRONMENT RESEARCH COUNCIL



Inter-comparison of Heitronics KT15.85 IIP and ISAR (www.isar.org.uk) onboard BSB ferry *Friedrichshafen* (useful data from 07.09. to 23.09.2020).

First results to be presented at the 6th Sentinel-3 Val Team meeting.

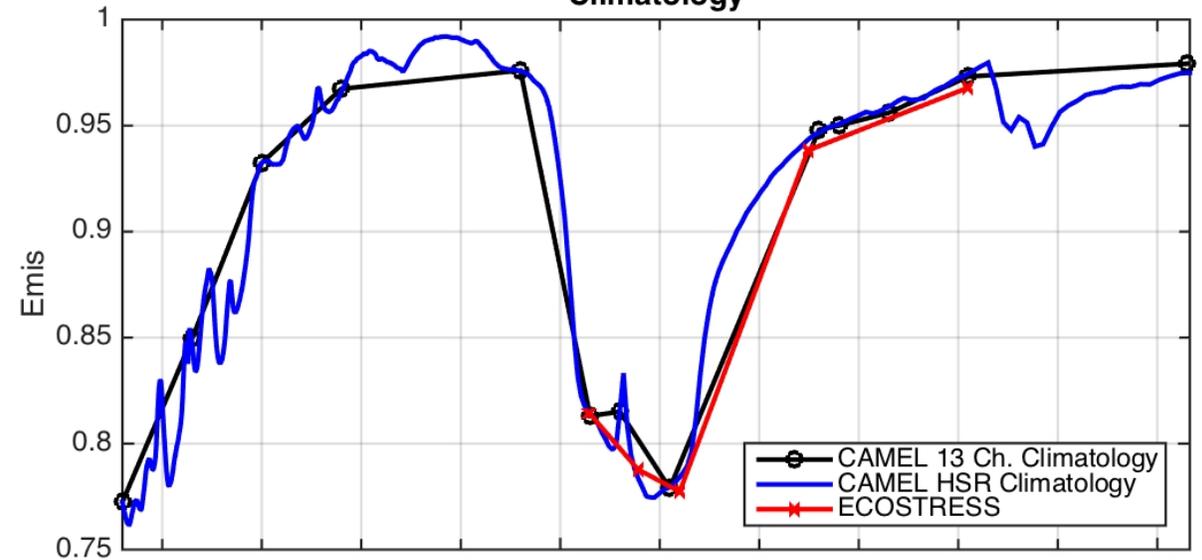
www.eumetsat.int/website/home/Data/ScienceActivities/ScienceStudies/ThermalInfraredProductIntercomparisonandValidationwithFRMRadiometers/index.html

LST&E (3/4)

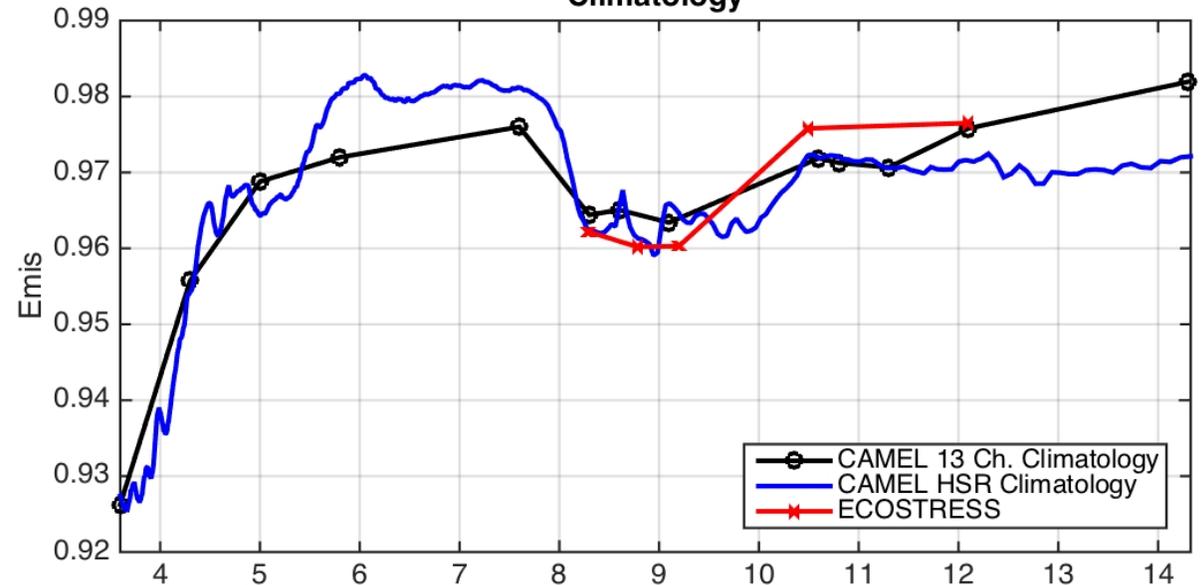
Combined
MODIS and
ASTER
Emissivity for
Land (CAMEL)
validation



Namib 2000-2016 July
Climatology



ARM_SGP 2000-2016 Feb
Climatology



Recent LST&E publications

- J. Ma et al. (2020), A global long-term (1981–2000) land surface temperature product for NOAA AVHRR. Earth System Science Data, doi: 10.5194/essd-2020-143 (accepted)
- Z. Bian et al. (2020), Retrieving Soil and Vegetation Temperatures From Dual-Angle and Multipixel Satellite Observations. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 13, pp. 5536-5549, doi: 10.1109/JSTARS.2020.3024190.
- Hulley et al. (2020), Validation and quality assessment of the ECOSTRESS level-2 land surface temperature and emissivity product, Rem. Sens. Environ, in review.
- Loveless et al. (2020), The Combined ASTER MODIS Emissivity Over Land (CAMEL) Version 2 Climatology, Remote Sensing, in submission.

Surface Radiation

Downward radiance validation best practices protocol

- Dr. Christian Lanconelli, Project Manager of Baseline Surface Radiation Network (BSRN), agreed to join as co-author of the protocol.

Workshop

- BSRN 2020 Virtual Workshop was held on October 1, 2020. Discussed to form albedo working group

Land Surface Phenology

- Cohrs et al. RS paper on HLS-LSP product in silviculture
 - is a unique independent assessment/validation of the new HLS-LSP product using ground observations in managed pine stands

- New approach to retrieving long-term LSP using a Bayesian approach
 - validation w/ existing long-term data at Hubbard Brook and Harvard Forest, and intercomparison with HLS-LSP

- Berra & Gaulton. FORECO review paper on the intercomparison of in-situ and satellite phenological metrics
 - advantages and drawbacks of ground, near-surface and aerial validation data

- Rodriguez-Galiano, V. & Dash J. Land surface phenology as indicator of global terrestrial ecosystem dynamics: a systematic review. Accepted in “ISPRS Journal of Photogrammetry and Remote Sensing”

Open Access Article

Sentinel-2 Leaf Area Index Estimation for Pine Plantations in the Southeastern United States

by  Chris W. Cohrs^{1,*}  Rachel L. Cook¹  Josh M. Gray^{1,2} and  Timothy J. Albaugh³ 

¹ Department of Forestry and Environmental Resources, College of Natural Resources, North Carolina State University, Raleigh, NC 27607, USA

² Center for Geospatial Analytics, North Carolina State University, Raleigh, NC 27607, USA

³ Department of Forest Resources and Environmental Conservation, Virginia Tech, Blacksburg, VA 24061, USA

* Author to whom correspondence should be addressed.

Remote Sens. **2020**, *12*(9), 1406; <https://doi.org/10.3390/rs12091406>

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(This article belongs to the Section **Forest Remote Sensing**)



Forest Ecology and Management

Volume 480, 15 January 2021, 118663



Remote sensing of temperate and boreal forest phenology: A review of progress, challenges and opportunities in the intercomparison of in-situ and satellite phenological metrics

Elias F. Berra^{a,*,}  Rachel Gaulton^b

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<https://doi.org/10.1016/j.foreco.2020.118663>

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